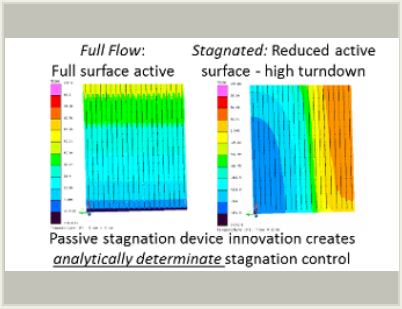
Controlled Stagnation Radiator, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

NASA Technology Roadmap Area 14 outlines a turn down goal of 6 to 1 by a thermal control system operating at the scale of kilowatts of heat removal. These thermal control systems must be designed to perform this turn-down and turn-up within a required time frame reliably and predictably. Paragon?s innovation will achieve this with lower weight, less complexity, and reduced costs, all while maintaining a highly flexible design. The Controlled Stagnation Radiator offers the ideal combination of maximized radiator performance at high heat loads and a high turndown ratio via controlled, determinate stagnation at low heat loads. By placing one or more passive pressure equalization devices on some of the radiator fluid tubes, that portion of the radiator becomes more resistant to stall, and those tubes without the innovation will be the first to stagnate. In effect, this system provides controlled stagnation by adding local stagnation resistance, rather than by adding mechanical systems which increase complexity and mass, or flow imbalance which impact design load performance. Since the implementation of the innovation has no impact to the flow distribution in the design load case the radiator can both be optimized for full flow performance and be designed to exhibit determinate performance in deep stagnation for high turndown and intermediate loads, as is required of modern spacecraft thermal control system design. This improvement upon the state of the art is expected to mature stagnation technology by giving the system greatly improved performance determinance which will allow the solution to be baselined for use in next generation spacecraft and optimized for any application with minimized design cycle, testing, cost and schedule impact. The innovation concept is also highly compatible with Paragon?s xRad radiator manufacturing technique, meaning that any size and aspect ratio of radiator panel can be easily manufactured without the need for complex tooling.



Controlled Stagnation Radiator, Phase I Briefing Chart Image

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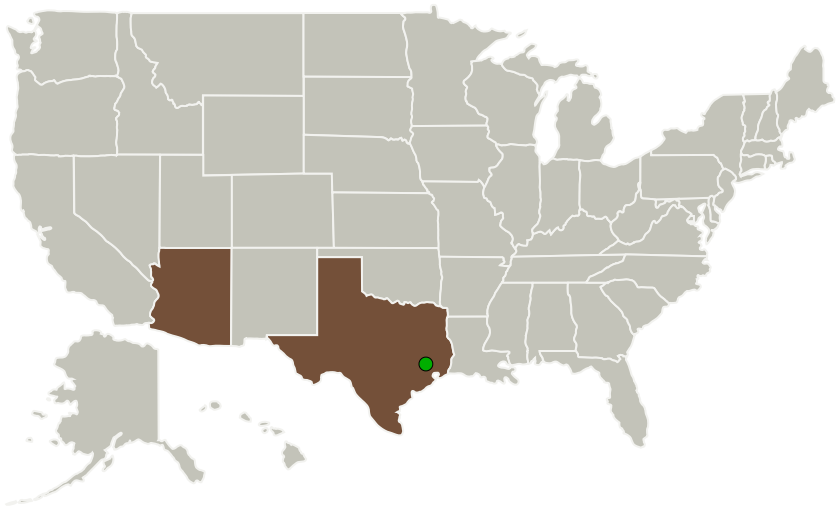
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Paragon Space Development Corporation	Lead Organization	Industry	Tucson, Arizona
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Arizona	Texas

Project Transitions

June 2017: Project Start

December 2017: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140811)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Paragon Space Development Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

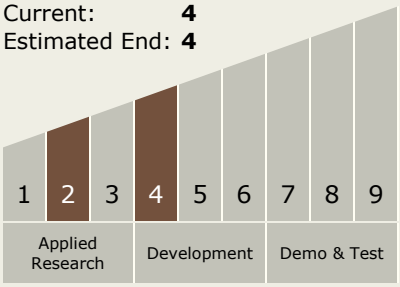
Carlos Torrez

Principal Investigator:

Norman Hahn

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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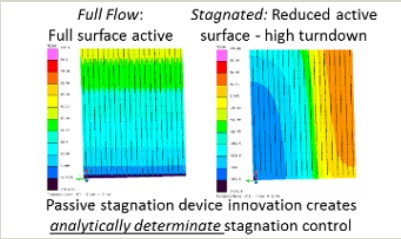
Images



Briefing Chart Image
Controlled Stagnation Radiator, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/128743)*

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.3 Heat Rejection and Storage

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System